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Residential Fuelwood Consumption and Production in South Dakota, 1994

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FOREWORD

This bulletin reports the results of a survey of residential fuelwood consumption and production in South Dakota for a 1-year period encompassing the 1993/1994 heating season. Topics examined include the geographic distribution of residential fuelwood consumption and production within the State; the species of trees used for residential fuelwood; the types of wood-burning facilities used; the reasons for burning fuelwood; and the land, ownership, and tree classes from which fuelwood was produced. Such detailed information is necessary for intelligent planning and decisionmaking in wood procurement, forest resource management, forest industry development, and forest research.

Special thanks are given to the South Dakota households and commercial producers who supplied information for this survey. Their cooperation is greatly appreciated.

The Kansas State University Department of Horticulture, Forestry and Recreation Resources is acknowledged for its cooperation in conducting the survey, and special thanks are offered to the faculty, staff, and students involved for their diligence in phoning and questioning the survey respondents.

In this bulletin, consumption refers to the volume of fuelwood burned by South Dakota's households, regardless of the source of the fuelwood (roundwood, wood residues from primary or secondary manufacturing, scrap or waste wood products, etc.). Production refers only to the volume of roundwood harvested to supply South Dakota's wood-burning households. This report *does not* include information about harvesting for industrial fuelwood. Such information is included in reports covering wood use by primary processing plants.

Row and column data of tables may not sum due to rounding, but data in each table cell are accurately displayed.

Residential Fuelwood Consumption and Production in South Dakota, 1994

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CONSUMPTION

- About one in four South Dakota households had facilities to burn wood in 1994, but only two-thirds of them actually burned wood in that year (table 1).
- As a result, only about one in six households burned wood in 1994, but a higher proportion was expected to burn wood in 1995.
- In 1994, the proportions of households possessing and using wood-burning facilities were almost two times higher in the Western Unit of the State than in the Eastern Unit (table 1 and fig. 1).
- In 1994, more than 8,000 households planned to install wood-burning facilities. About two-thirds of these will be new installations; the rest will be replacement or supplemental units for households already engaged in wood burning.

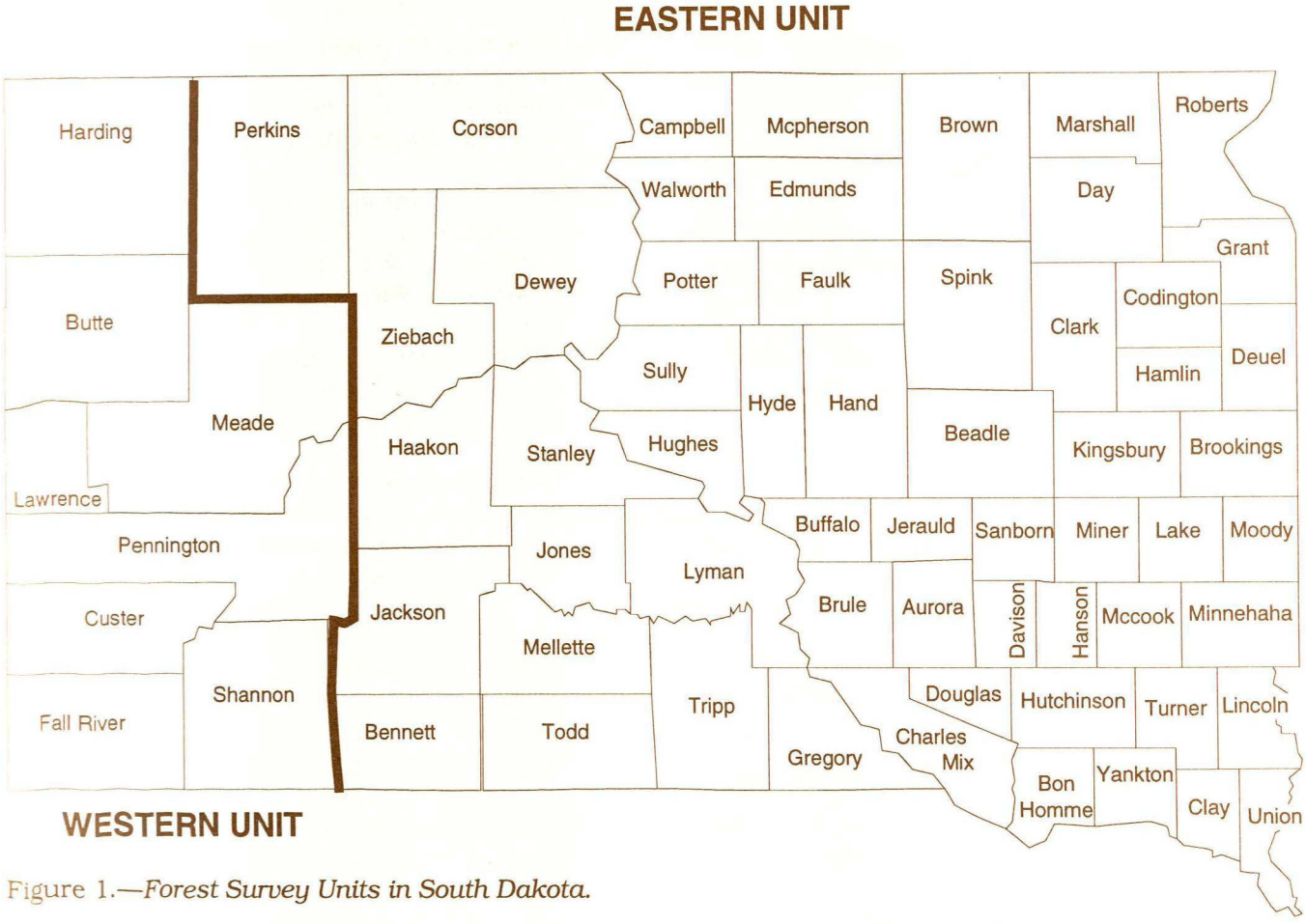

Figure 1.—*Forest Survey Units in South Dakota.*

Dennis M. May, Research Forester, received a B.S. degree in forest management from the University of Maine and an M.S. degree in forest resources from the University of Idaho. He joined the USDA Forest Service in December 1983, and has been working with the North Central Station's Forest Inventory and Analysis Unit since May 1992.

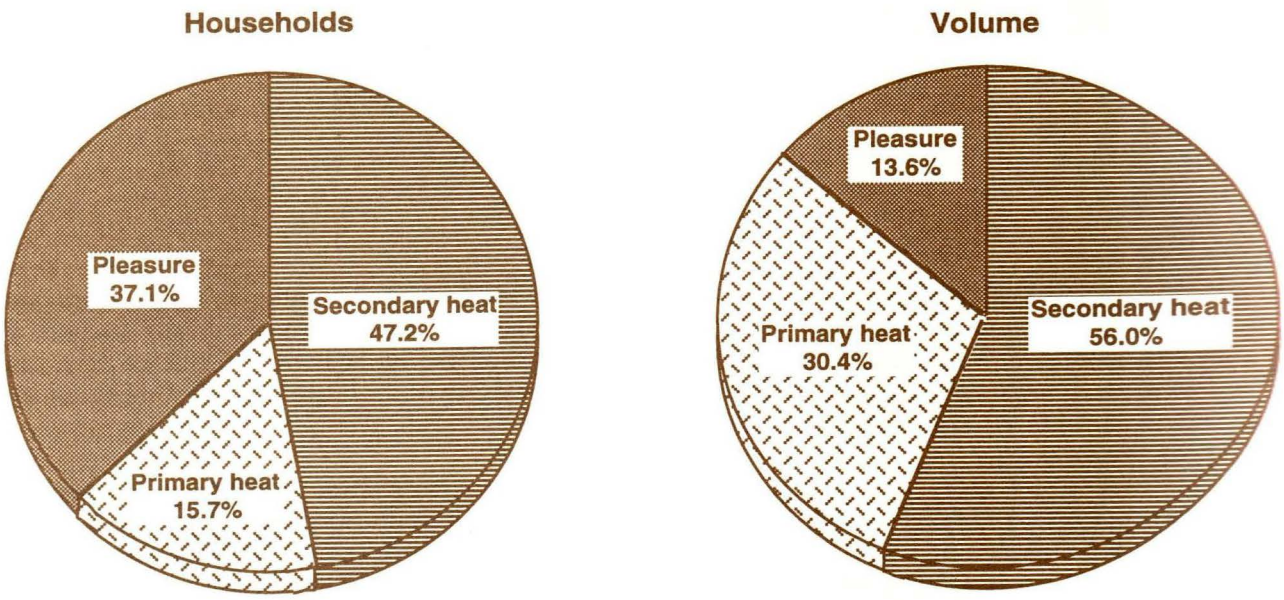

Figure 2.—*Distribution of residential fuelwood consumption by reason for burning, South Dakota, 1994*

- Most of the increased possession and use of wood-burning facilities was expected to occur in the Eastern Unit.
- On average, each of South Dakota's wood-burning households burned 1.7 cords of fuelwood in 1994, for a total consumption of just over 78 thousand cords (table 2).
- Close to half of all wood-burning households burned wood as a secondary heat source, making it the primary reason for burning fuelwood in 1994.
- Although pleasure is the second most popular reason for burning wood, households that used wood in this way consumed only about half a cord of fuelwood on average, a fraction of the volume consumed by households that heated with wood.
- As a result, more than four-fifths of the fuelwood consumed in 1994 was for home-heating purposes (table 2 and fig. 2).
- Wood stoves and fireplaces were the two most popular types of wood-burning facilities used in South Dakota; fireplaces were the most popular type in the Eastern Unit and wood stoves were the most popular type in the Western Unit (table 3).
- More than 90 percent of households with wood stoves burned wood for home heat, while two-thirds of the households with fireplaces burned wood for pleasure (table 4).
- As a result, far more wood (half of total consumption) was burned in households with wood stoves, than in the equally numerous households with fireplaces in 1994 (fig. 3).
- In 1994, three-fifths of South Dakota's wood burners were long-time veterans who had burned wood for at least 5 years (table 5).
- These veterans were more likely to burn wood for home-heating purposes (fig. 4), and consequently burned almost three-quarters of all fuelwood consumed in 1994.
- More than nine-tenths of the fuelwood burned in 1994 was consumed at primary residences (table 6).
- Almost all of the fuelwood burned came from roundwood, but about 10 percent of the households relied on wood residues or pellets for all or part of their fuelwood needs in 1994 (table 7).
- Four species—ash, elm, pine, and cottonwood—accounted for more than nine-tenths of

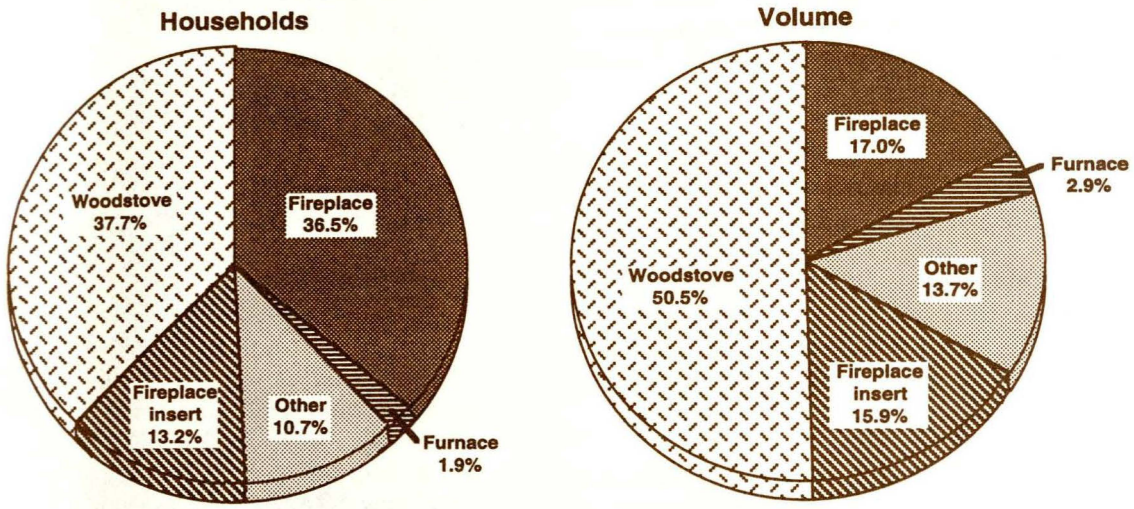

Figure 3.—*Distribution of residential fuelwood consumption by wood-burning facility, South Dakota, 1994.*

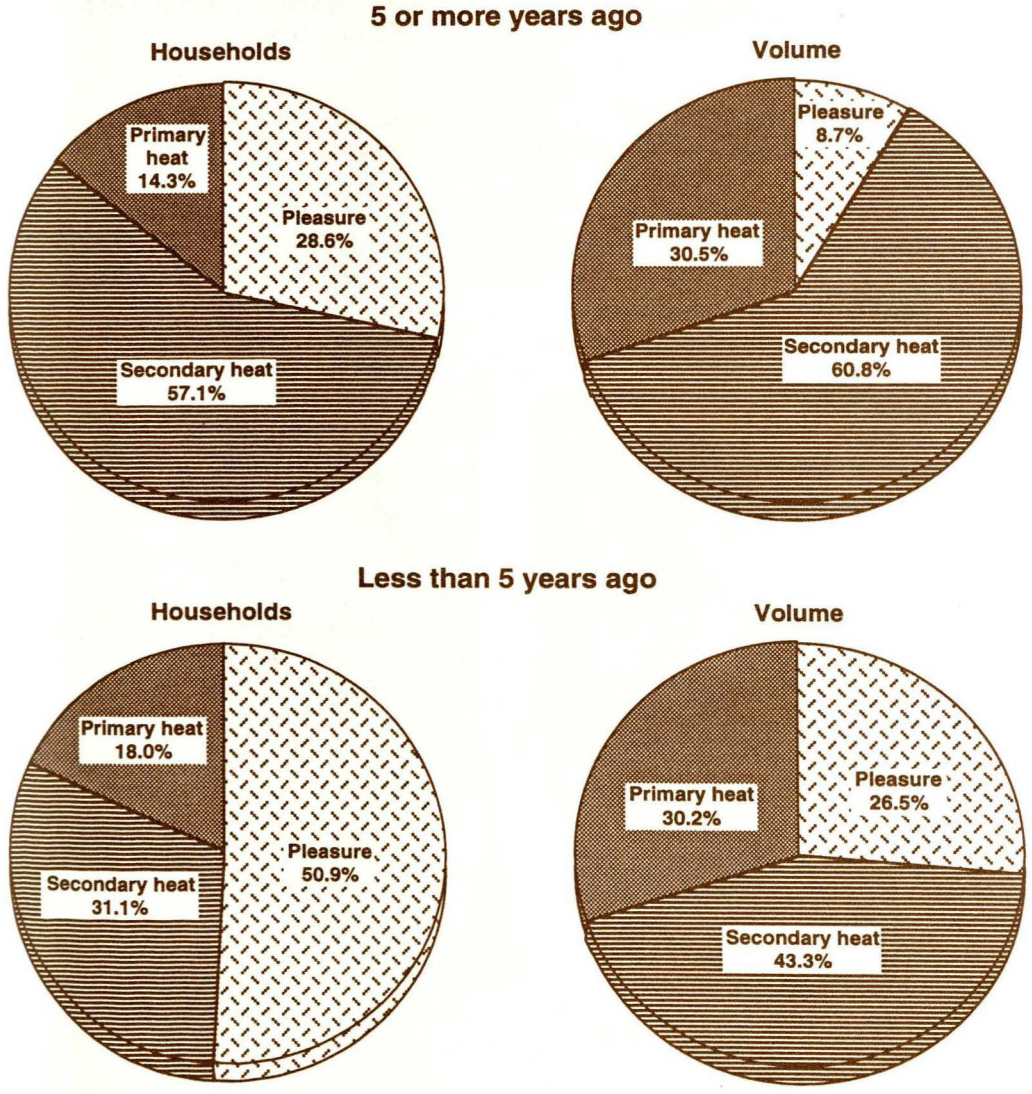

Figure 4.—*Distribution of residential fuelwood consumption by reason for burning and year first burned wood, South Dakota, 1994.*

the volume burned; pine was the predominant species burned in the Western Unit and cottonwood use was concentrated in the Eastern Unit (table 8).

- More than three-fifths of South Dakota's wood-burning households cut all or part of the fuelwood they burned in 1994 (table 9).

- In total, three-fifths of the volume burned in 1994 was cut by residents of wood-burning households. Most of the remaining volume, one-third of the total consumption, was purchased (fig. 5).

- Purchasing of fuelwood was more prevalent in the Western Unit than in the Eastern Unit.

- Purchased wood was most frequently delivered in cords of stove-length wood, commonly referred to as face cords or ricks (table 10). Sixteen-inch wood was most common, but 24-inch wood was also popular.

- On average, households that purchased fuelwood burned about 1.5 cords of purchased wood each in 1994.

PRODUCTION

- In 1994, 68 thousand cords of roundwood fuelwood were cut in South Dakota to meet the State's current and future residential fuelwood demands (table 11).

- This production was about equally split between forest land and nonforest land sources; the bulk of the forest land sources came from dead trees (fig. 6).

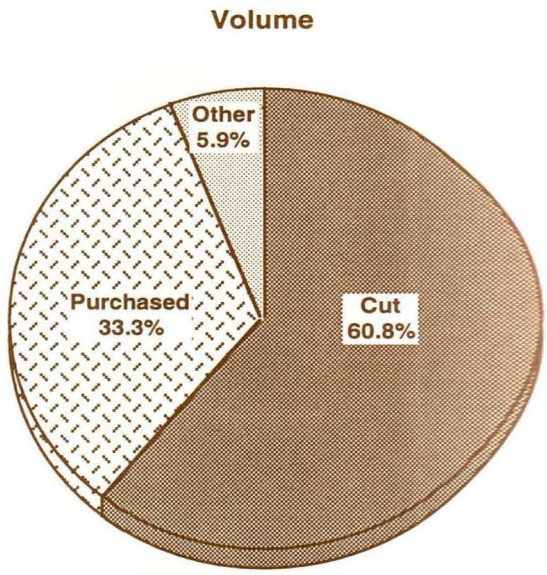

Figure 5.—*Distribution of residential fuelwood consumption by method of procurement, South Dakota, 1994.*

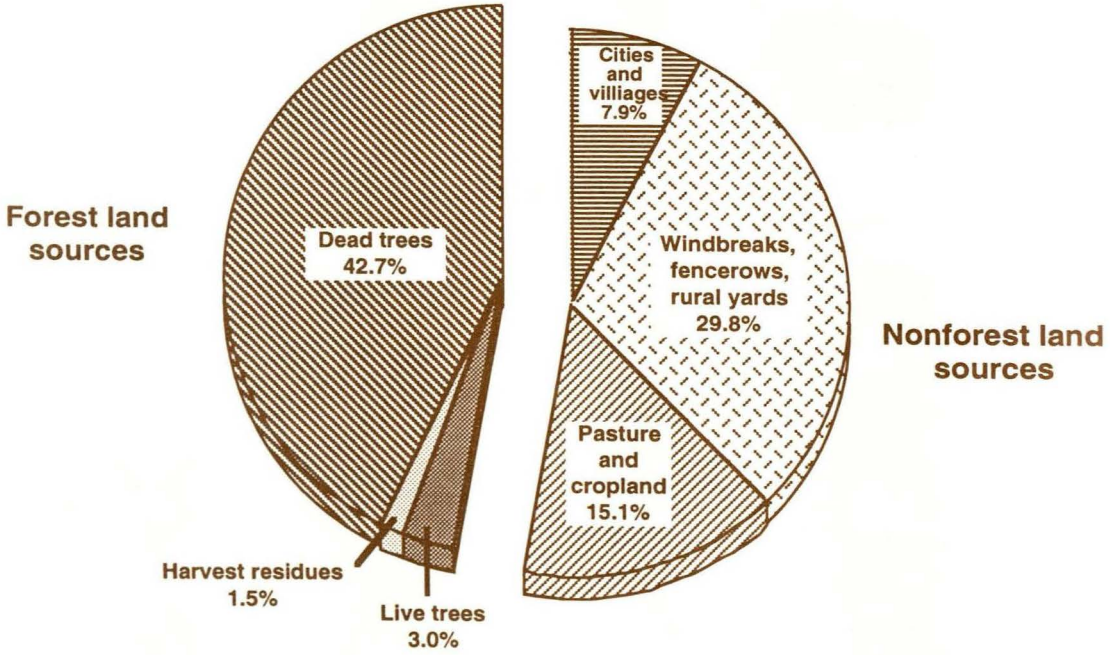

Figure 6.—*Distribution of residential fuelwood production by source of material, South Dakota, 1994.*

- Four species—elm, ash, cottonwood, and pine—accounted for nine-tenths of the fuelwood cut (table 12); pine was cut predominantly from the Western Unit and cottonwood was cut predominantly from the Eastern Unit (table 13).

- Private lands supplied more than nine-tenths of the fuelwood harvested; most of the remainder come from national forest lands in the Western Unit (tables 14, 15).

- In 1994, less than 2 percent of all fuelwood produced was cut from growing-stock portions of live timberland trees (tables 16, 17 and fig. 7). As a consequence, fuelwood removals had very little impact on the growing-stock inventory of South Dakota, the traditional supply source of the State's primary wood-using industry.

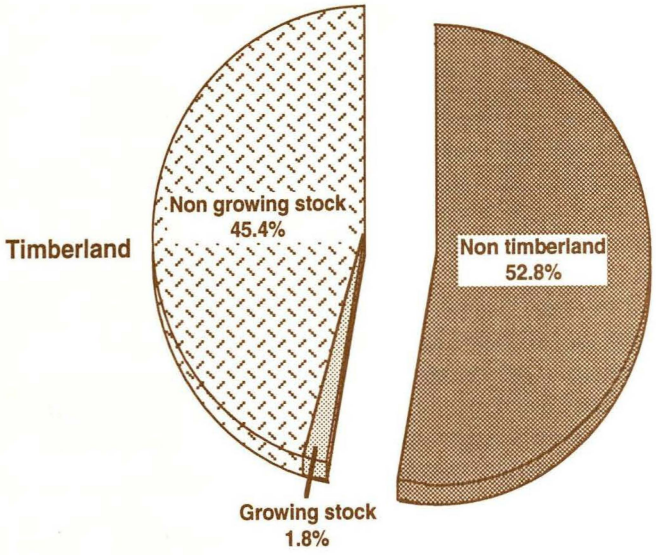

Figure 7.—*Distribution of timber removals associated with residential fuelwood production, South Dakota, 1994*

APPENDIX

STUDY METHODS

Data for this publication were collected by a telephone survey conducted during September 1994 by the Department of Horticulture, Forestry and Recreation Resources at Kansas State University. The telephone survey sampled South Dakota households and canvassed all known commercial producers, using formal questionnaires prepared by the North Central Forest Experiment Station and approved by the Federal Office of Management and Budget.

Households

The sampled universe encompassed all households in South Dakota with telephones. A total sample size of 900 households was selected based on funding available and a desired standard error of less than ± 20 percent statewide at one standard deviation. The total number of samples was proportionally distributed across the counties in the State based on the number of households in each county. The county samples were evenly distributed across the three-digit telephone exchanges in each county. A random list of telephone numbers was generated for each county using all listed three-digit phone exchanges. One call was placed (whether successful or unsuccessful) to each of the random telephone numbers until the necessary number of residential households within each exchange and county was contacted. In total, about 1 in 287 households were sampled. Sample responses were expanded to population estimates of total fuelwood use based on this sample rate.

Commercial Producers

A list of commercial fuelwood producers was compiled from advertisements for firewood sales discovered in a one time search of all South Dakota newspapers and telephone directory yellow pages. A total of 25 commercial producers were found. All of these commercial producers were canvassed about their production of residential fuelwood, using a formal questionnaire similar to that used for households. Possible duplicate sampling of commercial producers was minimized by cross checking telephone numbers of all sample households producing more than 20 cords of fuelwood against the commercial producers list.

Completed questionnaires were sent to the North Central Forest Experiment Station for editing and processing. Some respondents did not know the tree species cut or burned for fuel, except in general terms such as mixed hardwoods. As part of the processing, general species groupings were prorated to individual species specifically identified as being harvested or burned in a Forest Survey Unit.

SAMPLING ERROR

All the reported figures are estimates based on sampling procedures that are designed to give accurate estimates of residential fuelwood consumption and production. A measure of reliability of these figures is given by sampling errors. This sampling error means that the chances are two out of three that the results for the sample differ by no more than the amount indicated from the results that would have been obtained if a complete census of all households and commercial producers had been made. Sampling errors for estimates of residential fuelwood consumption and production in South Dakota are shown below:

Survey	Consumption (Cords)	Error (Percent)	Production (Cords)	Error (Percent)
Residential households	78,070	11.7	64,735	11.6
Commercial producers	—	—	3,111	—
State total	78,070	11.7	67,846	11.1

STUDY LIMITATIONS

This study reports both the consumption and production of residential fuelwood in South Dakota for a 1-year period ending at the time of the telephone survey, essentially encompassing the 1993/1994 burning season, but dated 1994 for reporting purposes. Consumption refers to the volume of fuelwood burned by South Dakota's wood-burning households, regardless of the source of the fuelwood (roundwood, wood residues from primary or secondary manufacturing, scrap or waste wood products, etc.). Production, on the other hand, refers only to the volume of roundwood harvested to supply South Dakota's wood-burning households. Due to these definition differences, as well as seasoning time, leftover fuelwood inventories from previous years, gift or free wood, cross-State wood movement, fluctuating participation in wood burning, and use of wood residues and wood wastes, estimates of fuelwood production and consumption totals should not be expected to match in a given year.

Additionally, production does not include fuelwood produced from wood residues generated at primary wood-using mills (such as sawmills and cooperage mills), fuelwood produced from roundwood for industrial consumption, fuelwood produced from wood residues generated at secondary wood-using mills (such as millwork plants and furniture plants), or fuelwood produced from waste wood products. However, fuelwood produced from primary mill residues and fuelwood produced for industrial consumption are captured in other studies. And although fuelwood production from secondary mill residues and waste secondary wood products is beyond the scope of Forest Inventory and Analysis duties, part of this volume is captured in the consumption portion of the residential fuelwood studies.

Households without telephones were not sampled. To compensate for this omission, sample responses from households with phones were assumed representative of the relatively small number of households without phones, and were expanded across all existing households in South Dakota. Study results may be slightly biased if the fuelwood consumption or production per household differs significantly in quantity or sources between phoneless households and households with phones.

Some commercial producers may not advertise in newspapers or the yellow pages, or may not have been advertising when the commercial producers list was compiled. Consequently, some commercial producers may have been excluded from the study, which would result in a conservative estimate of fuelwood production.

To assess the impacts of fuelwood harvesting on the State's forest inventory from telephone survey responses, reported fuelwood harvests from "woodland areas outside of city or village limits" were assumed to be the same as forest land harvests, and all forest land harvests were assumed to be timberland harvests.

DEFINITION OF TERMS

Central stem.—The portion of a tree between a 1-foot stump and the minimum 4.0-inch top diameter outside bark or the point where the central stem breaks into limbs.

Commercial producers.—Commercial fuelwood operators. Those who harvest fuelwood to sell to dealers or consumers. Includes loggers who harvest fuelwood along with saw logs and other products.

Commercial species.—Tree species presently or prospectively suitable for industrial wood products. (Note: Excludes species of typically small

size, poor form, or inferior quality such as hophornbeam, Osage-orange, and redbud.)

Cord (standard fuelwood).—A pile of logs 4x4x8 feet (128 cubic feet including air space and bark). A standard cord of fuelwood contains 70 cubic feet of wood and 58 cubic feet of bark and air space.

Cull removals.—Net volume of rough and rotten trees, plus the net volume in sections of the central stem of growing-stock trees that do not meet regional merchantability standards, harvested for roundwood products.

Dead removals.—Net volume of dead trees harvested for roundwood products.

Diameter at breast height (d.b.h.).—The outside bark diameter at 4.5 feet above the forest floor on the uphill side of the tree. For determining breast height, the forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line.

Face cord.—A stack of stove-length wood (most commonly 16 inches wide) that is 4 feet high and 8 feet long, locally referred to as a "rick."

Forest land.—Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use. (Note: Stocking is measured by comparing specified standards with basal area and/or number of trees, age or size, and spacing.) The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width of at least 120 feet to qualify as forest land. Unimproved roads and trails, streams, or other bodies of water or clearings in forest areas shall be classed as forest if less than 120 feet wide.

Fuelwood consumption.—The fuelwood burned by residential households.

Fuelwood production.—The volume of roundwood harvested to supply residential households.

Growing-stock removals.—The growing-stock volume removed from the timberland inventory by harvesting roundwood products. (Note: Includes sawtimber removals, poletimber removals, and logging residues.)

Growing-stock tree.—A live timberland tree of commercial species that meets specified standards of size, quality, and merchantability. (Note: Excludes rough, rotten, and dead trees.)

Growing-stock volume.—Net volume of growing-stock trees 5.0 inches d.b.h. and over, from 1 foot above the ground to a minimum 4.0-inch top diameter outside bark of the central stem or to the point where the central stem breaks into limbs.

Hardwoods.—Dicotyledonous trees, usually broad-leaved and deciduous.

Harvest residues.—The total net volume of unused portions of trees cut or killed by logging. (Note: Includes both logging residues and logging slash.)

Limbwood removals.—Net volume of all portions of a tree other than the central stem, (including forks, large limbs, tops, and stumps) harvested for roundwood products.

Logging residue.—The net volume of unused portions of the merchantable central stem of growing-stock trees cut or killed by logging.

Logging slash.—The net volume of unused portions of the unmerchantable (non-growing-stock) sections of trees cut or killed by logging.

Merchantable sections.—Sections of the central stem of growing-stock trees that meet either pulpwood or saw-log specifications.

Net volume.—Gross volume less deductions for rot, sweep, or other defects affecting use for roundwood products.

Noncommercial species.—Tree species of typically small size, poor form, or inferior quality that normally do not develop into trees suitable for industrial roundwood products.

Nonforest land.—Land that has never supported forests, and land formerly forested where use for timber management is precluded by development for other uses. (Note: Includes areas used for crops, improved pasture, residential areas, city parks, improved roads of any width and adjoining clearings, powerline clearings of any width, and 1- to 39.9-acre areas of water classified by the Bureau of the Census as land. If intermingled in forest areas, improved roads and

nonforest strips must be more than 120 feet wide and more than 1 acre to qualify as nonforest land.)

Nonforest land removals.—Net volume of trees on nonforest lands harvested for roundwood products.

Nontimberland.—The same as nonforest land in this report.

Poletimber.—A growing-stock tree at least 5.0 inches d.b.h. but smaller than sawtimber size (9.0 inches d.b.h. for softwoods, 11.0 inches d.b.h. for hardwoods).

Poletimber removals.—Net volume in the merchantable central stem of poletimber trees harvested for roundwood products.

Primary wood-using mills.—Mills receiving roundwood or chips from roundwood for processing into primary products (lumber, plywood, etc.).

Rotten tree.—A tree that does not meet regional merchantability standards because of excessive unsound cull.

Rough tree.—A tree that does not meet regional merchantability standards because of excessive sound cull. Includes noncommercial tree species.

Roundwood.—Logs, bolts, or other round sections cut from trees (including chips from roundwood).

Sapling.—A live tree between 1.0 and 5.0 inches d.b.h.

Sapling removals.—Net volume in saplings harvested for roundwood products.

Saw-log portion.—That portion of the central stem of sawtimber trees between the stump and the saw-log top.

Saw-log top.—The point on the central stem of sawtimber trees above which a saw log can not be produced. The minimum saw-log top is 7.0 inches d.o.b. for softwoods and 9.0 inches d.o.b. for hardwoods.

Sawtimber removals.—The net volume in the merchantable central stem of sawtimber trees harvested for roundwood products. (Note: Includes the saw-log and upper-stem portions of sawtimber trees.)

Sawtimber tree.—A growing-stock tree containing at least a 12-foot saw log or two noncontiguous saw logs 8 feet or longer, and meeting regional specifications for freedom from defect. Softwoods must be at least 9.0 inches d.b.h. and hardwoods must be at least 11.0 inches d.b.h.

Secondary wood-using mills.—Mills receiving primary wood products for manufacture into secondary wood products (furniture, cabinets, etc.).

Softwoods.—Coniferous trees, usually evergreen, having needles or scale-like leaves.

Tree.—A woody plant usually having one or more perennial stems, a more or less definitely formed crown of foliage, and a height of at least 12 feet at maturity.

Timberland.—Forest land that is producing, or is capable of producing, in excess of 20 cubic feet per acre per year of industrial roundwood products under natural conditions, is not withdrawn from timber utilization by statute or administrative regulation, and is not associated with urban or rural development. In this report, all forest land removals were assumed to be timberland removals.

Upper stem portion.—That portion of the central stem of sawtimber trees between the saw-log top and the minimum top diameter of 4.0 inches outside bark or to the point where the central stem breaks into limbs.

Wood residues.—Includes woody material (bark, coarse, fine, etc.) generated at primary wood-using mills, woody material (sawdust, scrap, trim, wood flour, etc.) generated at secondary wood-using plants, and waste secondary wood products.

COMMON AND SCIENTIFIC NAMES OF TREE SPECIES MENTIONED

SOFTWOODS

Cedar

Rocky mountain juniper ....*Juniperus scopulorum*
Eastern redcedar .....*Juniperus virginiana*

Pine
Austrian pine ..... *Pinus nigra*
Ponderosa pine ..... *Pinus ponderosa*
Scotch pine ..... *Pinus sylvestris*
Spruce
White spruce ..... *Picea glauca*

HARDWOODS

Ash
Green ash ..... *Fraxinus pennsylvanica*
Aspen
Quaking aspen ..... *Populus tremuloides*
Birch
Paper birch ..... *Betula papyrifera*
Boxelder ..... *Acer negundo*
Cottonwood
Eastern cottonwood ..... *Populus deltoides*
Plains cottonwood ..... *Populus deltoides* var. *occidentalis*
Elm
American elm ..... *Ulmus americana*
Siberian elm ..... *Ulmus pumila*
Slippery elm ..... *Ulmus rubra*
Rock elm ..... *Ulmus thomasii*
Hackberry ..... *Celtis occidentalis*
Maple
Silver maple ..... *Acer saccharinum*
Mulberry
Red mulberry ..... *Morus rubra*
Oak
White oak
Bur oak ..... *Quercus macrocarpa*
Walnut
Black walnut ..... *Juglans nigra*
Noncommercial species
Apple ..... *Malus* spp.
Plum ..... *Prunus* spp.

TABLE TITLES

Table 1.—Household possession and use of wood-burning facilities by Forest Survey Unit, South Dakota, 1994

Table 2.—Residential fuelwood consumption by reason for burning and Forest Survey Unit, South Dakota, 1994

Table 3.—Residential fuelwood consumption by type of wood-burning facility and Forest Survey Unit, South Dakota, 1994

Table 4.—Residential fuelwood consumption by type of wood-burning facility and reason for burning, South Dakota, 1994

Table 5.—Residential fuelwood consumption by reason for burning and year first burned wood, South Dakota, 1994

Table 6.—Residential fuelwood consumption by place of consumption, South Dakota, 1994

Table 7.—Residential fuelwood consumption by type of fuelwood, South Dakota, 1994

Table 8.—Residential fuelwood consumption by species group and Forest Survey Unit, South Dakota, 1994

Table 9.—Residential fuelwood consumption by method of procurement and Forest Survey Unit, South Dakota, 1994

Table 10.—Residential consumption of purchased fuelwood by size of wood, South Dakota, 1994

Table 11.—Residential fuelwood production by source of material and Forest Survey Unit, South Dakota, 1994

Table 12.—Residential fuelwood production from roundwood by species group and source of material, South Dakota, 1994

Table 13.—Residential fuelwood production from roundwood by species group and Forest Survey Unit, South Dakota, 1994

Table 14.—Residential fuelwood production from roundwood by species group and ownership class, South Dakota, 1994

Table 15.—Residential fuelwood production from roundwood by source of material and ownership class, South Dakota, 1994

Table 16.—Distribution of timber removals associated with residential fuelwood production by Forest Survey Unit, South Dakota, 1994

Table 17.—Distribution of timber removals associated with residential fuelwood production by species group, South Dakota, 1994

Table 1. -- Household possession and use of wood-burning facilities by Forest Survey Unit, South Dakota, 1994

(In number of households)

Forest Survey Unit	Households	Households with wood-burning facilities	Households burning wood in 1994	Households planning to burn wood in 1995	Households planning to install wood-burning facilities
Eastern	202,425	43,651	31,302	33,600	6,031
Western	56,609	22,974	14,359	15,508	2,010
Total	259,034	66,625	45,661	49,107	8,041

Table 2. -- Residential fuelwood consumption by reason for burning and Forest Survey Unit, South Dakota, 1994

Forest Survey Unit and reason for burning	Number of households	Volume (Cords)	Average (Cords/ household)
Eastern			
Pleasure	12,636	6,464	0.51
Primary heat	3,733	12,384	3.32
Secondary heat	14,933	29,337	1.96
Total	31,302	48,185	1.54
Western			
Pleasure	4,308	4,134	0.96
Primary heat	3,446	11,377	3.30
Secondary heat	6,605	14,373	2.18
Total	14,359	29,885	2.08
All Units			
Pleasure	16,943	10,598	0.63
Primary heat	7,179	23,762	3.31
Secondary heat	21,538	43,710	2.03
Total	45,661	78,070	1.71

Table 3. -- Residential fuelwood consumption by type of wood-burning facility and Forest Survey Unit, South Dakota, 1994

Forest Survey Unit and wood-burning facility	Number of households	Volume (Cords)	Average (Cords/ household)
Eastern			
Stove	10,913	25,860	2.37
Furnace	862	2,294	2.66
Fireplace insert	2,872	5,388	1.88
Fireplace	13,210	9,846	0.75
Fire pit	2,010	1,650	0.82
Combinations	1,436	3,147	2.19
Total	31,302	48,185	1.54
Western			
Stove	6,318	13,579	2.15
Fireplace insert	3,159	6,988	2.21
Fireplace	3,446	3,404	0.99
Fire pit	862	1,161	1.35
Combinations	574	4,753	8.28
Total	14,359	29,885	2.08
All Units			
Stove	17,231	39,438	2.29
Furnace	862	2,294	2.66
Fireplace insert	6,031	12,376	2.05
Fireplace	16,656	13,250	0.80
Fire pit	2,872	2,811	0.98
Combinations	2,010	7,900	3.93
Total	45,661	78,070	1.71

Table 4. -- Residential fuelwood consumption by type of wood-burning facility and reason for burning, South Dakota, 1994

Type of facility	All reasons		Reason for burning					
			Primary heat		Secondary heat		Pleasure	
	Number of households	Volume (Cords)	Number of households	Volume (Cords)	Number of households	Volume (Cords)	Number of households	Volume (Cords)
Stove	17,231	39,438	5,169	15,672	10,626	22,893	1,436	873
Furnace	862	2,294	287	950	574	1,344	-	-
Fireplace insert	6,031	12,376	1,436	6,565	3,159	5,515	1,436	296
Fireplace	16,656	13,250	287	574	5,456	6,345	10,913	6,331
Fire pit	2,872	2,811	-	-	-	-	2,872	2,811
Combinations	2,010	7,900	-	-	1,723	7,613	287	287
Total	45,661	78,070	7,179	23,762	21,538	43,710	16,943	10,598

Table 5. -- Residential fuelwood consumption by reason for burning and year first burned wood, South Dakota, 1994

Reason for burning and year first burned wood	Number of households	Volume (Cords)	Average (Cords/ household)
Pleasure			
Last year	4,308	3,117	0.72
2 years ago	2,585	1,059	0.41
3 years ago	1,723	1,362	0.79
4 years ago	287	132	0.46
5 or more years ago	8,041	4,928	0.61
Total	16,943	10,598	0.63
Primary heat			
Last year	1,149	1,273	1.11
2 years ago	287	264	0.92
3 years ago	1,149	2,646	2.30
4 years ago	574	2,271	3.95
5 or more years ago	4,020	17,307	4.30
Total	7,179	23,762	3.31
Secondary heat			
Last year	1,149	1,061	0.92
2 years ago	1,723	4,141	2.40
3 years ago	1,723	2,272	1.32
4 years ago	862	1,768	2.05
5 or more years ago	16,082	34,468	2.14
Total	21,538	43,710	2.03
All reasons			
Last year	6,605	5,452	0.83
2 years ago	4,595	5,464	1.19
3 years ago	4,595	6,280	1.37
4 years ago	1,723	4,171	2.42
5 or more years ago	28,143	56,703	2.01
Total	45,661	78,070	1.71

Table 6. -- Residential fuelwood consumption by place of consumption, South Dakota, 1994

Forest Survey Unit and place of consumption	Number of households	Volume consumed					Average (Cords/ household)
		Primary residence (Cords)	Secondary residence (Cords)	Other building (Cords)	Other[1] (Cords)	Total consumption (Cords)	
Eastern							
Primary residence	27,282	42,845	-	-	-	42,845	1.57
Secondary residence	287	-	689	-	-	689	2.40
Other building	2,010	-	-	3,513	-	3,513	1.75
Other[1]	1,436	-	-	-	850	850	0.59
Combination	287	57	-	-	230	287	1.00
Total	31,302	42,903	689	3,513	1,080	48,185	1.54
Western							
Primary residence	13,210	27,773	-	-	-	27,773	2.10
Other building	287	-	-	950	-	950	3.31
Other[1]	862	-	-	-	1,161	1,161	1.35
Total	14,359	27,773	-	950	1,161	29,885	2.08
All units							
Primary residence	40,492	70,618	-	-	-	70,618	1.74
Secondary residence	287	-	689	-	-	689	2.40
Other building	2,297	-	-	4,464	-	4,464	1.94
Other[1]	2,297	-	-	-	2,011	2,011	0.88
Combination	287	57	-	-	230	287	1.00
Total	45,661	70,676	689	4,464	2,241	78,070	1.71

[1] Consumed at campsites.

Table 7. -- Residential fuelwood consumption by type of fuelwood, South Dakota, 1994

Forest Survey Unit and type of fuelwood	Number of households	Volume consumed				Average (Cords/ household)
		Roundwood (Cords)	Wood residues (Cords)	Wood pellets (Cords)	Total consumption (Cords)	
Eastern						
Roundwood	28,718	44,564	-	-	44,564	1.55
Wood residues	1,149	-	2,294	-	2,294	2.00
Combination	1,436	741	585	-	1,327	0.92
Total	31,302	45,305	2,880	-	48,185	1.54
Western						
Roundwood	12,349	27,609	-	-	27,609	2.24
Wood residues	287	-	132	-	132	0.46
Wood pellets	574	-	-	555	555	0.97
Combination	1,149	1,395	193	-	1,588	1.38
Total	14,359	29,005	325	555	29,885	2.08
All Units						
Roundwood	41,066	72,174	-	-	72,174	1.76
Wood residues	1,436	-	2,426	-	2,426	1.69
Wood pellets	574	-	-	555	555	0.97
Combination	2,585	2,137	778	-	2,915	1.13
Total	45,661	74,310	3,205	555	78,070	1.71

Table 8. -- Residential fuelwood consumption by species group and Forest Survey Unit, South Dakota, 1994

(In cords)

Species group	All Units	Forest Survey Unit	
		Eastern	Western
Softwoods			
Cedar	506	294	212
Spruce	178	-	178
Pine	15,234	2,863	12,371
Total softwoods	15,917	3,157	12,761
Hardwoods			
Maple	637	637	-
Boxelder	366	366	-
Birch	388	6	382
Ash	22,036	16,511	5,525
Walnut	251	251	-
Apple	334	334	-
Cottonwood	14,955	12,982	1,973
Aspen	1,691	-	1,691
Plum	152	-	152
Oak	2,670	1,421	1,249
Elm	18,673	12,520	6,152
Total hardwoods	62,153	45,029	17,124
All species	78,070	48,185	29,885

Table 9. -- Residential fuelwood consumption by method of procurement and Forest Survey Unit, South Dakota, 1994

Forest Survey Unit and procurement method	Number of households	Volume purchased (Cords)	Volume cut (Cords)	Volume other[1] (Cords)	Total consumption (Cords)	Average (Cords/ household)
Eastern						
Buy[1]	10,626	10,254	-	797	11,051	1.04
Cut	17,231	-	30,968	-	30,968	1.80
Cut and Buy[1]	3,446	2,581	2,895	690	6,165	1.79
Total	31,302	12,835	33,863	1,487	48,185	1.54
Western						
Buy[1]	7,179	12,133	-	2,151	14,284	1.99
Cut	5,169	-	11,292	-	11,292	2.18
Cut and Buy[1]	2,010	1,018	2,280	1,012	4,310	2.14
Total	14,359	13,151	13,571	3,163	29,885	2.08
All Units						
Buy[1]	17,805	22,387	-	2,948	25,335	1.42
Cut	22,400	-	42,260	-	42,260	1.89
Cut and Buy[1]	5,456	3,599	5,175	1,702	10,475	1.92
Total	45,661	25,986	47,435	4,649	78,070	1.71

[1] Includes gift wood, free wood, leftover wood, etc.

Table 10. -- Residential consumption of purchased fuelwood by size of wood, South Dakota, 1994

Size of wood purchased	Number of households	Volume (Cords)	Average (Cords/ household)
16 inch	10,051	12,468	1.24
24 inch	4,308	8,784	2.04
6 foot	287	8	0.03
8 foot	1,149	2,944	2.56
Random length residues	1,149	695	0.61
Random length roundwood	862	976	1.13
Tree length	287	111	0.39
Total purchased	18,092	25,986	1.44

Table 11. -- Residential fuelwood production by source of material and Forest Survey Unit, South Dakota, 1994

(In cords)

		Source of material					
					Forest land		
Forest Survey Unit	All sources	Cities and villages	Windbreaks, fencerows, rural yards	Pasture and cropland	Standing live trees	Harvest residues	Dead trees
Eastern	47,158	4,132	15,043	7,534	599	-	19,851
Western	20,688	1,223	5,171	2,737	1,405	1,051	9,100
Total	67,846	5,355	20,214	10,271	2,004	1,051	28,950

Table 12. -- Residential fuelwood production from roundwood by species group and source of material, South Dakota, 1994

(In cords)

Species group	All sources	Source of material					
		Cities and villages	Windbreaks, fencerows, rural yards	Pasture and cropland	Forest land		
					Standing live trees	Harvest residues	Dead trees
Softwoods							
Cedar	715	67	65	184	-	-	400
Pine	10,761	1,067	82	477	1,268	620	7,247
Total softwoods	11,476	1,134	146	661	1,268	620	7,647
Hardwoods							
Maple	62	2	5	28	*	-	26
Boxelder	492	18	123	191	1	-	159
Hackberry	1,100	60	859	181	-	-	-
Ash	17,354	728	3,980	1,466	215	-	10,964
Walnut	186	-	-	-	1	-	184
Apple	300	28	223	49	-	-	-
Mulberry	88	60	14	14	-	-	-
Cottonwood	15,096	734	6,628	4,426	19	-	3,289
Aspen	1,636	13	71	499	42	359	653
Oak	1,730	210	-	-	27	72	1,421
Elm	18,326	2,368	8,165	2,755	431	-	4,607
Total hardwoods	56,370	4,222	20,068	9,610	736	431	21,303
All species	67,846	5,355	20,214	10,271	2,004	1,051	28,950

* Less than one-half cord.

Table 13. -- Residential fuelwood production from roundwood by species group and Forest Survey Unit, South Dakota, 1994

(In cords)

Species group	All Units	Forest Survey Unit	
		Eastern	Western
Softwoods			
Cedar	715	715	-
Pine	10,761	1,724	9,037
Total softwoods	11,476	2,439	9,037
Hardwoods			
Maple	62	62	-
Boxelder	492	492	-
Hackberry	1,100	1,100	-
Ash	17,354	14,110	3,244
Walnut	186	186	-
Apple	300	300	-
Mulberry	88	88	-
Cottonwood	15,096	13,603	1,493
Aspen	1,636	-	1,636
Oak	1,730	881	849
Elm	18,326	13,898	4,428
Total hardwoods	56,370	44,719	11,650
All species	67,846	47,158	20,688

Table 14. -- Residential fuelwood production from roundwood by species group and ownership class, South Dakota, 1994

(In cords)

Species group	All ownerships	Ownership class		
		National forest	State	Other private
Softwoods				
Cedar	715	-	-	715
Pine	10,761	4,452	-	6,309
Total softwoods	11,476	4,452	-	7,024
Hardwoods				
Maple	62	-	*	62
Boxelder	492	-	*	491
Hackberry	1,100	-	2	1,099
Ash	17,354	100	7	17,247
Walnut	186	-	-	186
Apple	300	-	*	300
Mulberry	88	-	*	88
Cottonwood	15,096	-	14	15,082
Aspen	1,636	493	-	1,143
Oak	1,730	111	-	1,619
Elm	18,326	-	12	18,314
Total hardwoods	56,370	704	36	55,629
All species	67,846	5,156	36	62,654

* Less than one-half cord.

Table 15. -- Residential fuelwood production from roundwood by source of material and ownership class, South Dakota, 1994

Ownership class	All sources	Source of material					
		Cities and villages	Windbreaks, fencerows, rural yards	Pasture and cropland	Forest land		
					Standing live trees	Harvest residues	Dead trees
National forest	5,156	-	-	-	408	902	3,846
State	36	-	-	36	-	-	-
Other private	62,654	5,355	20,214	10,235	1,596	149	25,104
Total	67,846	5,355	20,214	10,271	2,004	1,051	28,950

Table 16. -- Distribution of timber removals associated with residential fuelwood production by Forest Survey Unit, South Dakota, 1994

(In thousand cubic feet)

Forest Survey Unit	Timberland removals								Total timberland removals	Non-timberland removals	Total Removals
	Growing-stock removals			Non-growing-stock removals							
	Sawtimber	Poletimber	Total	Limbwood	Sapling	Cull trees	Dead trees	Total			
Eastern	10	8	19	7	4	12	1,390	1,413	1,431	1,870	3,301
Western	38	26	64	65	11	30	639	745	809	639	1,448
Total	49	34	83	72	15	42	2,028	2,158	2,240	2,509	4,749

Table 17. -- Distribution of timber removals associated with residential fuelwood production by species group, South Dakota, 1994

(In thousand cubic feet)

Species group	Timberland removals										
	Growing-stock removals			Non-growing-stock removals					Total timberland removals	Non-timberland removals	Total Removals
	Sawtimber	Poletimber	Total	Limbwood	Sapling	Cull trees	Dead trees	Total			
Softwoods											
Cedar	-	-	-	-	-	-	28	28	28	22	50
Pine	30	21	51	44	10	26	508	588	639	114	753
Total softwoods	30	21	51	44	10	26	536	616	667	136	803
Hardwoods											
Maple	*	*	*	*	*	*	2	2	2	2	4
Boxelder	*	*	*	*	*	*	11	11	11	23	34
Hackberry	-	-	-	-	-	-	-	-	-	77	77
Ash	4	3	7	3	2	4	768	776	783	432	1,215
Walnut	*	*	*	*	*	*	13	13	13	-	13
Apple	-	-	-	-	-	-	-	-	-	21	21
Mulberry	-	-	-	-	-	-	-	-	-	6	6
Cottonwood	*	*	1	*	*	*	230	231	232	825	1,057
Aspen	6	3	8	17	*	2	46	66	74	41	115
Oak	1	1	2	4	*	1	100	104	106	15	121
Elm	7	6	13	5	3	8	323	339	353	930	1,283
Total hardwoods	18	13	31	29	6	15	1,492	1,542	1,573	2,373	3,946
All species	49	34	83	72	15	42	2,028	2,158	2,240	2,509	4,749

* Less than 500 cubic feet.

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Reports findings of the latest survey of residential fuelwood consumption and production in South Dakota. Topics examined include the geographic distribution of residential fuelwood consumption and production within the State; the species of trees used for residential fuelwood; the types of wood-burning facilities used; the reasons for burning fuelwood; and the land, ownership, and tree classes from which fuelwood was produced.

KEY WORDS: Fireplace, firewood, harvest, households, roundwood, wood stove.

Our job at the North Central Forest Experiment Station is discovering and creating new knowledge and technology in the field of natural resources and conveying this information to the people who can use it. As a new generation of forests emerges in our region, managers are confronted with two unique challenges: (1) Dealing with the great diversity in composition, quality, and ownership of the forests, and (2) Reconciling the conflicting demands of the people who use them. Helping the forest manager meet these challenges while protecting the environment is what research at North Central is all about.